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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/064,857	08/23/2002	Vincent K. Chan	00100020042	4596

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EXAMINER

TRAN, THANH Y

ART UNIT	PAPER NUMBER
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2841

DATE MAILED: 09/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/064,857

Applicant(s)

CHAN, VINCENT K.

Examiner

Thanh Y. Tran

Art Unit

2841

-- **Th MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 June 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____. 6) ☐ Other: _____

DETAILED ACTION

Applicant's arguments with respect to claims 1-26 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 20 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 20 is unclear as to what Applicant means by "wherein the plurality of second solder balls further create a control solder joint when the heat having a temperature greater than or equal to the first melting temperature but less than the second melting temperature is applied, wherein the control solder joint includes a melted outer layer of first material and the second solder ball having the second diameter?

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 2841

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-7, 15-16 and 18-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dockerty et al (U.S. 5,796,169) in view of Matthies et al (U.S. 6,527,159).

With respect to claim 1, Dockerty et al discloses a carrier substrate (1, Fig. 1) comprising a plurality of first solder members (12) having a first solder dimension and a first melting temperature (low melting temperature) disposed on the carrier substrate (1), and a plurality of second members (11) having a second member dimension and a second melting temperature (high melting temperature) disposed on the carrier substrate (1) in a corresponding relationship to the first plurality of solder members (12), wherein the first solder dimension is greater than the second member dimension and the second melting temperature is greater than the first melting temperature (see Fig. 1, col. 3, lines 48-67) and the second members. It should be noted that: since figure 1 shows that the length of contacts (2) is greater than the length of contacts (4), thus the dimension of first solder members (12) (corresponding to contacts 2) is considered greater than the dimension of second solder members.

Dockerty et al does not teach the carrier substrate disposed thereon with a solder dispensing machine and the second members disposed thereon with a solder dispensing machine. However, Matthies et al teaches carrier substrate (10) disposed thereon with a solder dispensing machine (see Figs. 1 and 2, element 14 and 30, col. 2, lines 9-22). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the device of Dockerty et al by using a solder dispensing machine as shown in figure 2 of

Art Unit: 2841

Matthies et al for the purpose of dispensing the bumps (solder balls) at a very high rate of speed, thus minimizing the time of manufacturer.

With respect to claim 2, Dockerty et al discloses a carrier substrate (1, Fig. 1) wherein the plurality of first solder members (12) and the plurality of second solder members (11) are disposed on a bottom surface of the carrier substrate (1).

With respect to claim 3, Dockerty et al discloses a carrier substrate (1, Fig. 1) further comprising an integrated circuit (3) disposed on the bottom surface of the carrier substrate (1).

With respect to claim 4, figure 5 of Dockerty et al further shows that carrier substrate (24) is capable of being soldered to a printed circuit board (1) and the plurality of second members define a minimum distance between the printed circuit board (1) and substrate (24).

Dockerty et al does not teach that the IC chip is mounted on an opposite side of carrier substrate and facing to the bottom surface of the PCB, so that the plurality of second members define a minimum distance between the printed circuit board and the integrated circuit.

However, the Examiner takes Official Notice that it is known to mount an IC chip on a bottom side of a carrier substrate that faces to the mounting surface of the PCB. Thus, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the reference of Dockerty et al. by replacing the mount of an IC chip on an bottom side of the substrate for the purpose of providing a compact package and also protecting the IC chip when it is mounted on the substrate with the PCB therebetween.

With respect to claims 5, and 18, figure 5 of Dockerty et al further shows that the carrier substrate (24) comprising at least one heat sink (27) disposed on a top surface of the carrier substrate.

Art Unit: 2841

With respect to claims 6 and 19, Dockerty et al discloses a carrier substrate (1, Fig. 1) wherein the plurality of second members (11) includes an outer layer of a solder material/first material having the first melting temperature (high melting temperature) (see col. 3, lines 57-60).

With respect to claim 7, Dockerty et al discloses a carrier substrate (1, Fig. 1) wherein the first solder member (12) is composed of a lead tin eutectic alloy (see col. 3, lines 60-63).

With respect to claim 15, it recites limitations similar to claim 1, Dockerty et al further discloses a an integrated circuit (Fig. 5) comprising a carrier substrate (24) having a bottom surface; a printed circuit board (1) having a top surface, and a solder ball array (11, 29) coupling the bottom surface of the carrier substrate (24) to the top surface of the printed circuit board (1). Thus claim 15 is rejected for the same reasons.

With respect to claim 16, it recites limitations similar to claim 4. Therefore, it is rejected for the same reasons.

With respect to claim 20, as best understood, all limitations in claim 20 are considered to read on the references of Dockerty et al and Matthies et al

Method claims 21-22 are deemed to be inherent upon the reference of Dockerty et al and Matthies et al as applied to claims 1-7 and 15-20.

Claims 8-14, 17, and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dockerty et al (U.S. 5,796,169) in view of Burnette (U.S. 5,956,606).

With respect to claim 8, it recites limitation similar to claim 1, Dockerty et al further teaches that a plurality of first solder paste (12) composed of a first material (lead tin) (see col. 3, lines 60-63). Dockerty et al does not teach the first solder paste is the first solder ball. Burnette

Art Unit: 2841

teaches a carrier substrate (320, Fig. 11) comprising a plurality of first solder balls (318) and the plurality of second solder balls (314). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to replace the plurality of first solder pastes of Dockerty et al by a plurality of first solder balls as taught by Burnette for providing good electrical and mechanical interconnection.

With respect to claims 9 and 14, Dockerty et al discloses a carrier substrate (1, Fig. 1) wherein the plurality of first solder paste (12) having a first dimension and the plurality of second solder balls (11) having a second dimension such that when heat, the heat having a temperature equal to the first melting temperature, and less than the second melting temperature, is applied to the solder ball array, only the plurality of first solder paste (12) are melted (see Figs. 1 and 2). It should be noted that: since the first solder paste (12) has the lower melting temperature than the second solder ball (11), thus only the first solder paste will be melted when the heat having a temperature equal to the first melting temperature. Dockerty et al does not teach the first solder paste is the first solder ball. Burnette teaches a carrier substrate (320, Fig. 11) comprising a plurality of first solder balls (318) and the plurality of second solder balls (314). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to replace the plurality of first solder pastes of Dockerty et al by a plurality of first solder balls as taught by Burnette for providing good electrical and mechanical interconnection.

With respect to claim 10, figure 1 of Dockerty et al further shows that integrated circuit (3) disposed on the bottom side of the carrier substrate (1).

Art Unit: 2841

With respect to claim 11, figure 1 of Dockerty et al shows that the application specific integrated circuit (3) is capable of being soldered to a printed circuit board (1), and the plurality of second solder balls (11) define an air gap between the printed circuit board and the application specific integrated circuit (3).

With respect to claim 12, figure 5 of Dockerty et al further shows that the carrier substrate (24) comprising at least one heat sink (27) disposed on a top surface of the carrier substrate.

With respect to claim 13, Dockerty et al discloses a carrier substrate (1, Fig. 1) wherein the plurality of second members (11) includes an outer layer of a solder material/first material having the first melting temperature (high melting temperature) (see col. 3, lines 57-60).

With respect to claim 17, as best understood, it recites limitations similar to claim 10. Dockerty et al further discloses the second solder balls (minimum dimension) (11, Fig. 1) is defined between the application specific integrated circuit (3) and the printed circuit board (1). Thus, claim 17 is rejected for the same reasons.

Method claims 23-26 are deemed to be inherent upon the references of Dockerty et al and Burnette as applied to claims 8-14.

Art Unit: 2841

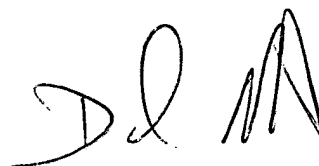
Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Y. Tran whose telephone number is (703) 305-4757. The examiner can normally be reached on Monday through Thursday and on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Martin, can be reached on (703) 308-3121. The fax phone number for the organization where this application or proceeding is assigned is (703) 305-3431.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

TYT

A handwritten signature in black ink, appearing to read 'D. L. M.', is positioned above the printed name and title of David Martin.

DAVID MARTIN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800